UNIVERSITI TEKNOLOGI MARA

SEISMIC PERFORMANCE OF PRECAST SHEAR-KEY WALL PANEL OF SINGLE BAY DOUBLE STORY HOUSE UNDER QUASI-STATIC LATERAL CYCLIC LOADING

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Thesis submitted in fulfillment
of the requirements for the degree of
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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

A full-scale of single bay double storey house (5.1m x 4.5m x 3.9m) was constructed using precast shear wall panel and cast-in situ wet connection at Construction Research Institute of Malaysia (CREAM), Malaysia. This type of building was designed using BS8110 which did not have any provision for seismic loading and no detailing of its connection. The aim of this study is to determine the global seismic behaviour of non-ductile double storey house under quasi-static lateral cyclic loading. This research work involves two main phases. The first phase includes design of double storey residential house, the construction of a full-scale prototype of double-storey residential house using precast wall panel, experimental set-up and calibration of instruments and testing of the specimen. The second phase includes the modeling of prototype using Ruaumoko programming. Two actuators were attached to the shear wall to simulate the lateral cyclic loading. Fourteen (14) linear potentiometers and twenty six (26) strain gauges were used to measure lateral displacement of precast wall panels and strain in steel and concrete. The maximum strength capacity of WALL1 is 244.27kN with lateral displacement of 18mm. A lot of cracks were observed at wet connections between wall and column and wall-beam interfaces. The building was started to loss its strength (strength degradation) at 0.5% drift and became unstable at 0.7% drift where the biggest opening of crack with 16.10mm was observed at wall-column interface. By using three chosen earthquake excitation, the mode shape, natural period and natural frequency are determined, followed by nodal displacement and positional drift were compared. All of the earthquakes have a similar value of force and the maximum values of these forces are axial forces, 442.2 kN, moment, 419.3kNm and shear force, 301.6 kN. In general, this type of building can only survive under low magnitude of earthquake loading and long distant-earthquakes centered in Sumatra.

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